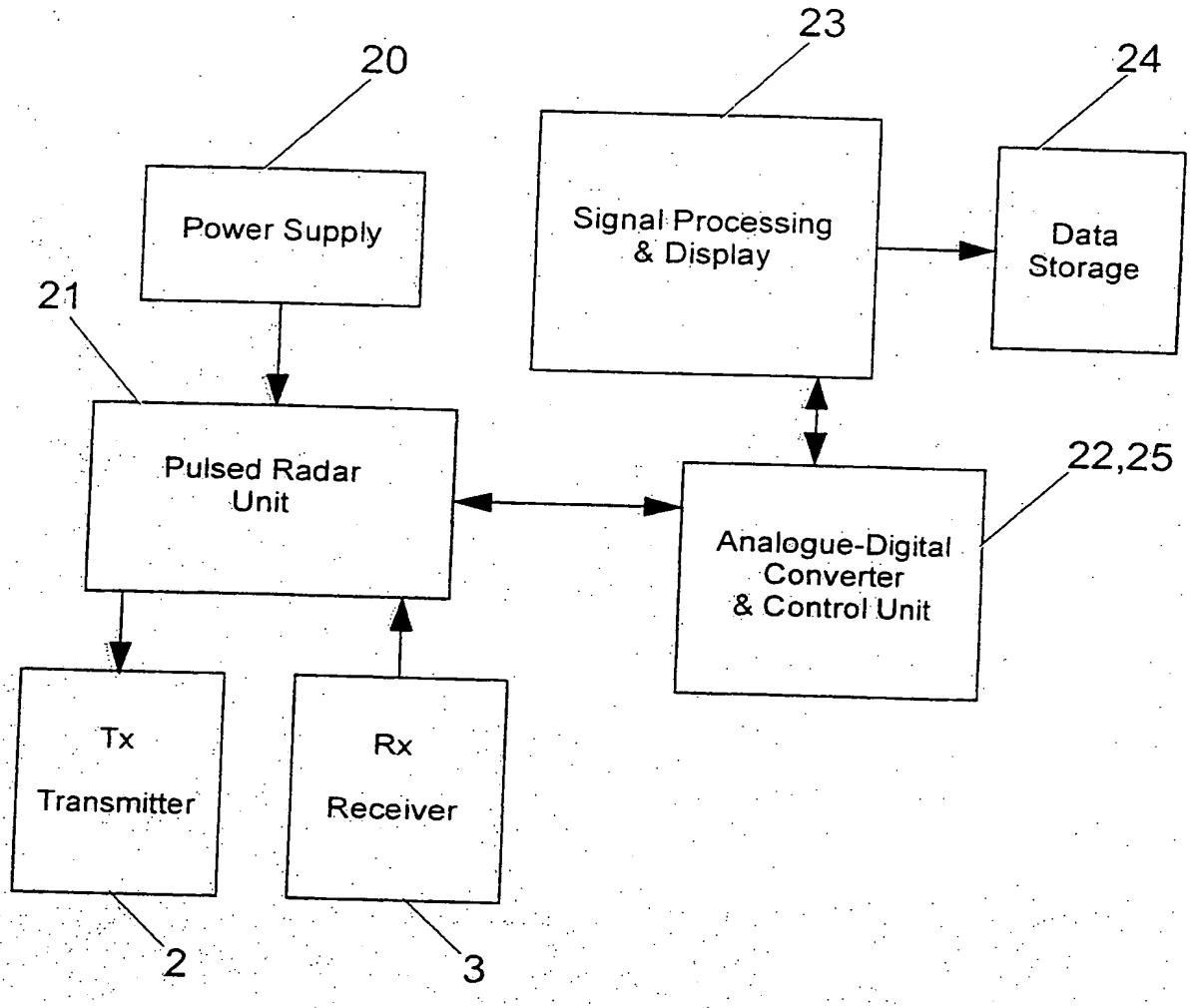
20
23
24
Power Supply
Signal Processing & Display
Data Storage
21
Pulsed Radar Unit
22,25
Analogue-Digital Converter & Control Unit
Tx
Transmitter
Rx
Receiver
2
3

Fig. 1

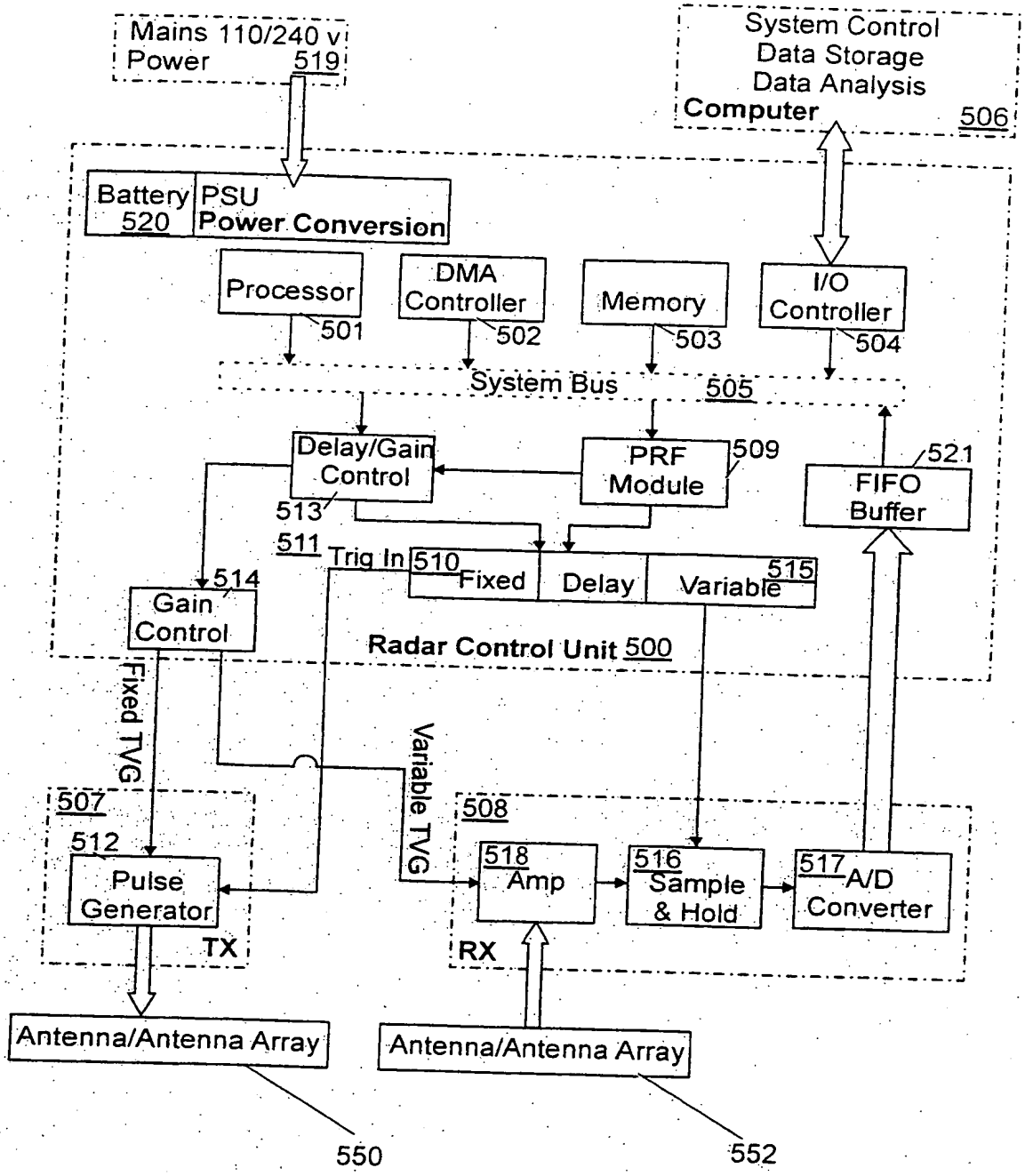
Mains 110/240 v Power 519
System Control Data Storage Data Analysis Computer 506
Battery 520
PSU Power Conversion
Processor 501
DMA Controller 502
Memory 503
I/O Controller 504
System Bus 505
Delay/Gain Control 513
PRF Module 509
FIFO Buffer 521
511 Trig In
510 Fixed Delay Variable 515
Gain Control 514
Radar Control Unit 500
Fixed TVG
Variable TVG
507
512
Pulse Generator
TX
508
518 Amp
516 Sample & Hold
517 A/D Converter
RX
Antenna/Antenna Array
Antenna/Antenna Array
550
552

Fig. 2

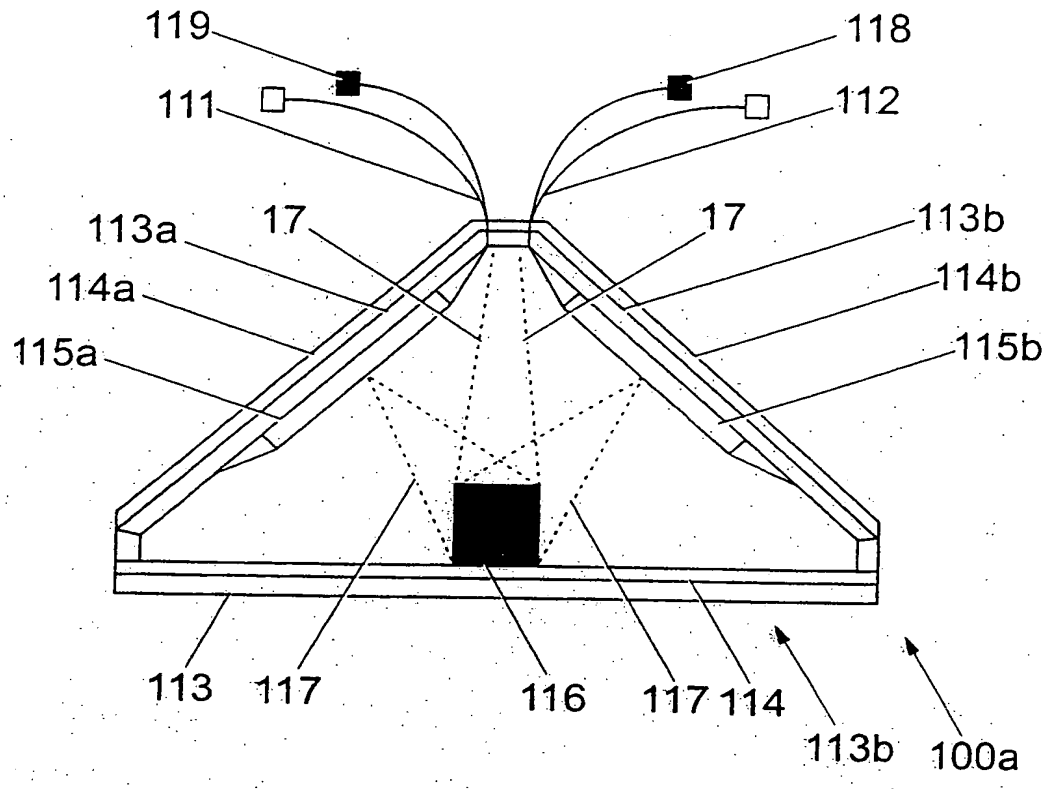
119
118
111
112
113a
17
17
113b
114a
114b
115a
115b
113
117
116
117
114
113b
100a

Fig. 3A

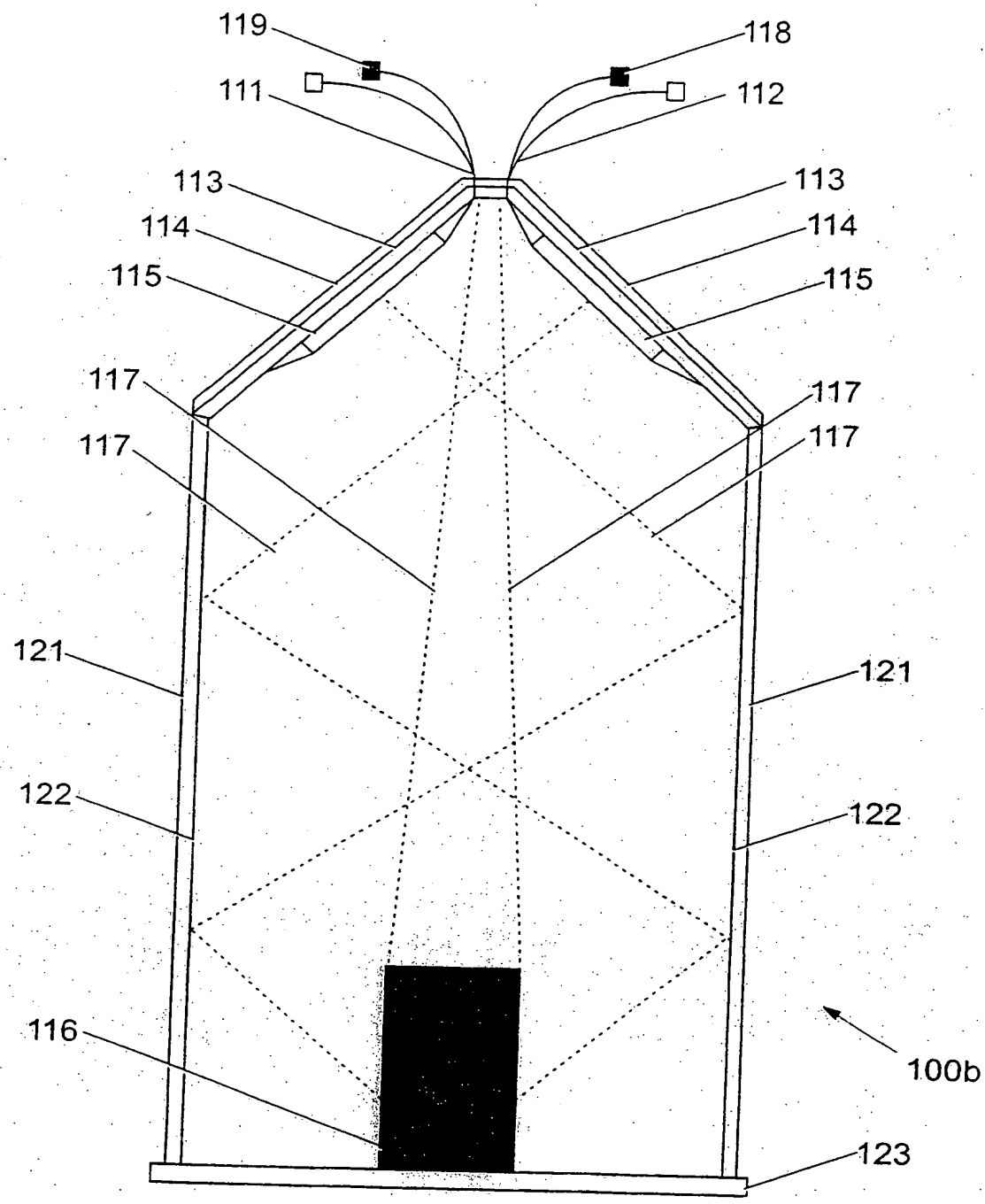
119
118
111
112
113
113
114
114
115
115
117
117
117
117
121
121
122
122
116
100b
123

Fig. 3B

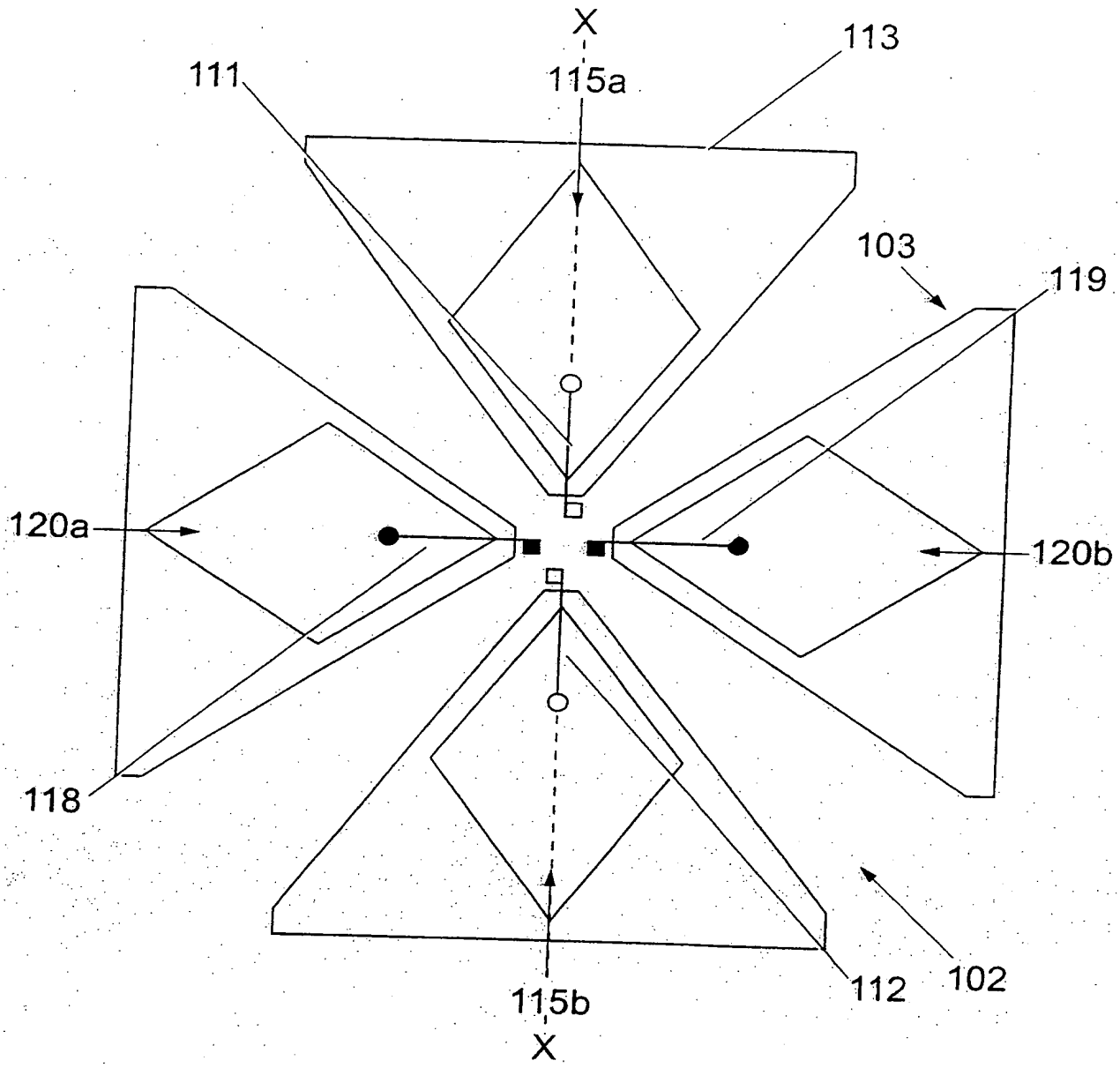

Fig. 4

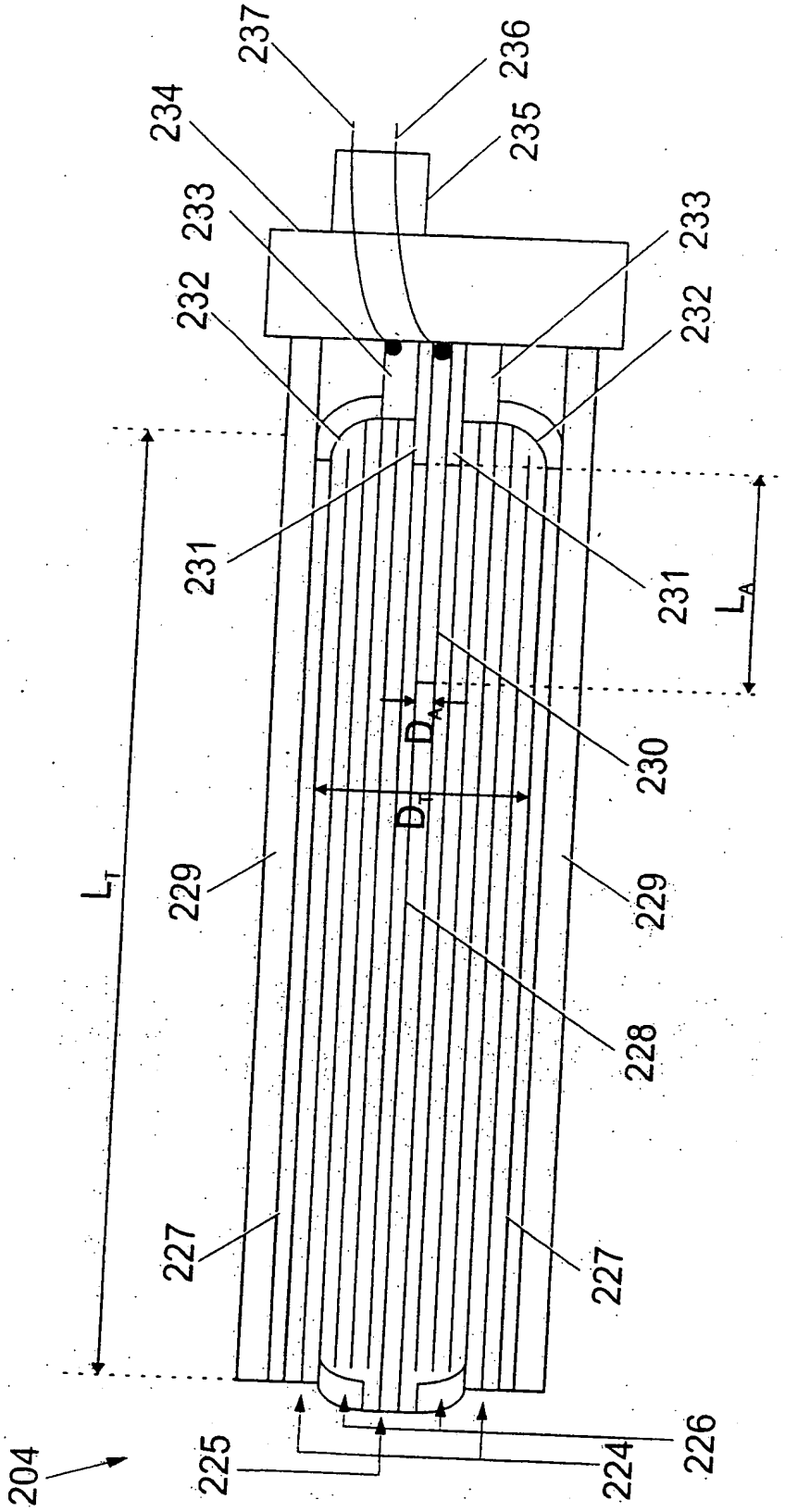
237
236
234
235
233
233
232
232
231
231
L_A
D_{A_1}
230
D_T
L_T
229
229
228
227
227
204
225
224
226

Fig. 5A

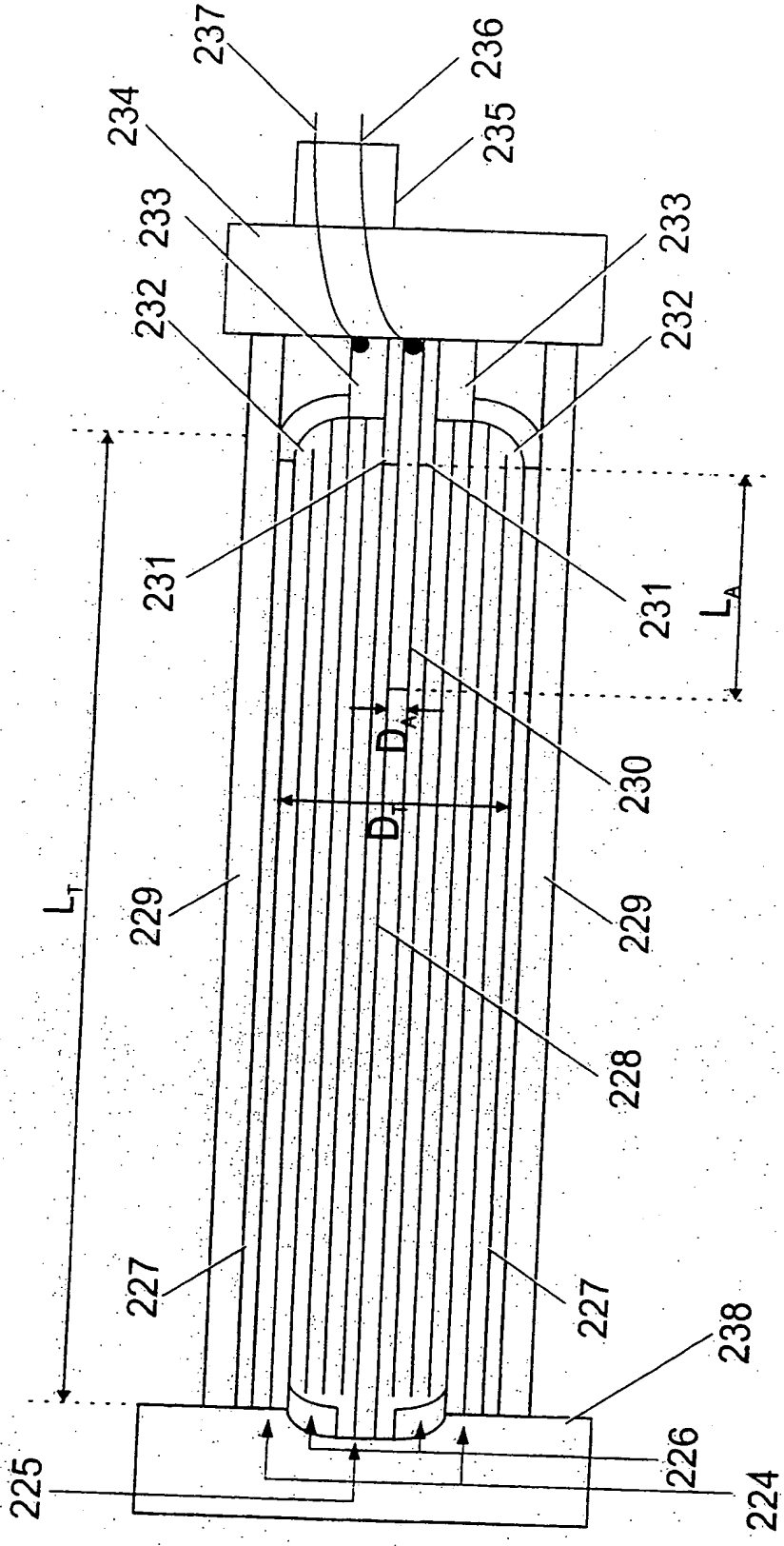
237
236
234
235
233
233
232
232
231
231
L_A
D_A
D_T
230
L_T
229
229
228
227
227
238
226
225
224

Fig. 5B

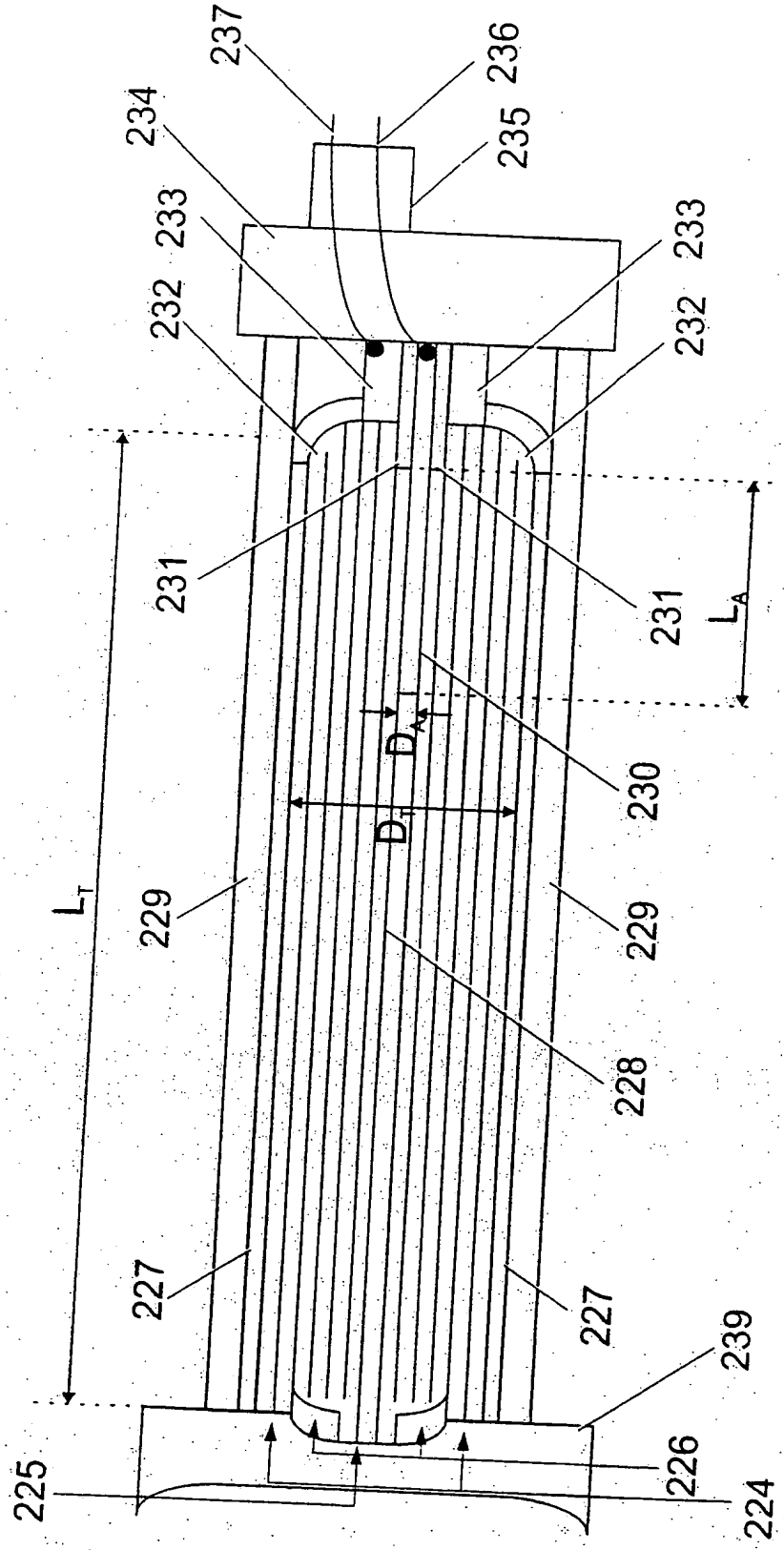
237
236
234
235
233
233
232
232
231
231
L_A
D_A
D_T
230
L_T
229
229
228
227
227
239
226
225
224

Fig. 5C

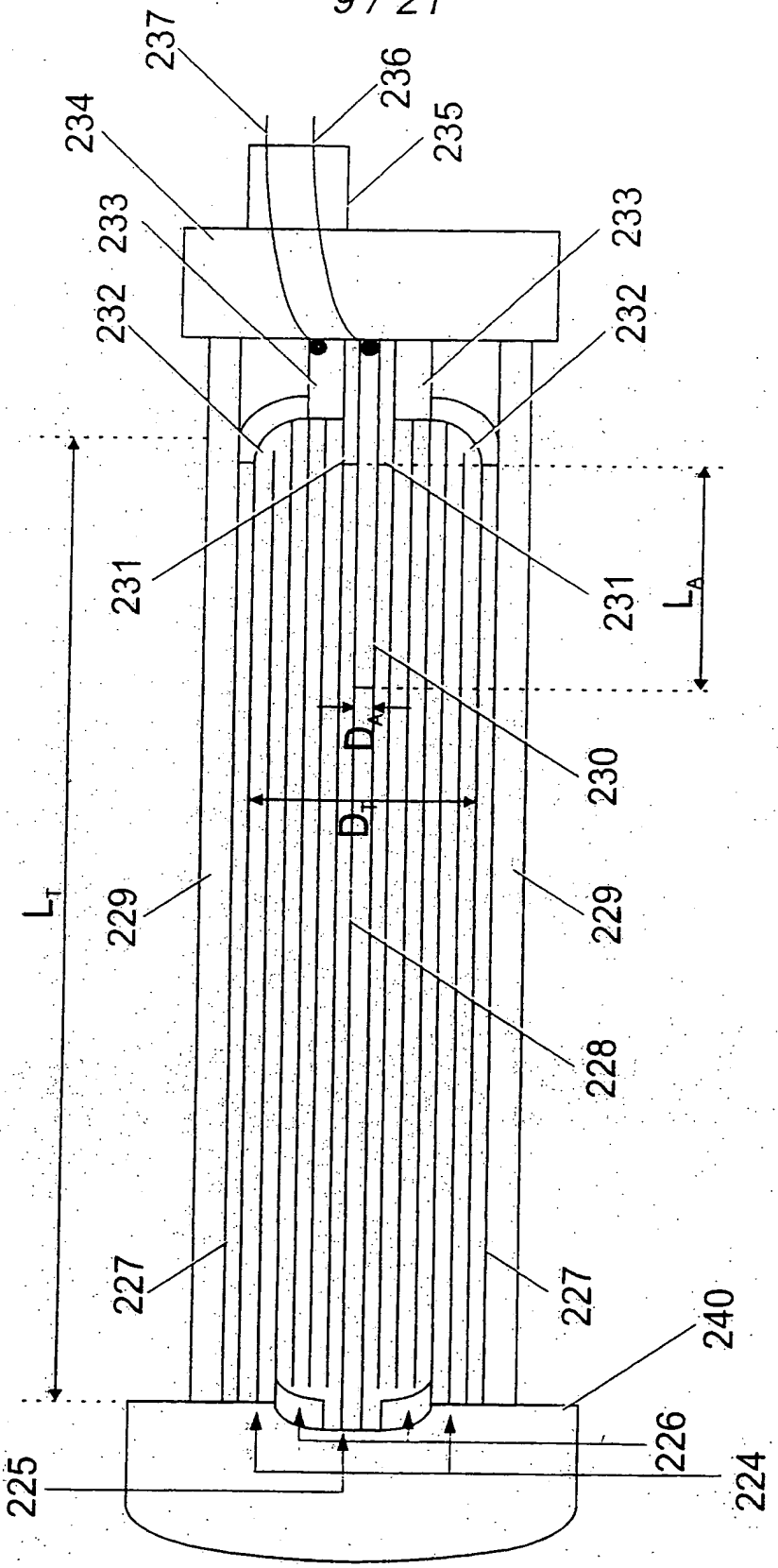
237
236
235
234
233
233
232
232
231
231
L_A
D_A
D_T
230
L_T
229
229
228
227
227
240
226
225
224

Fig. 5D

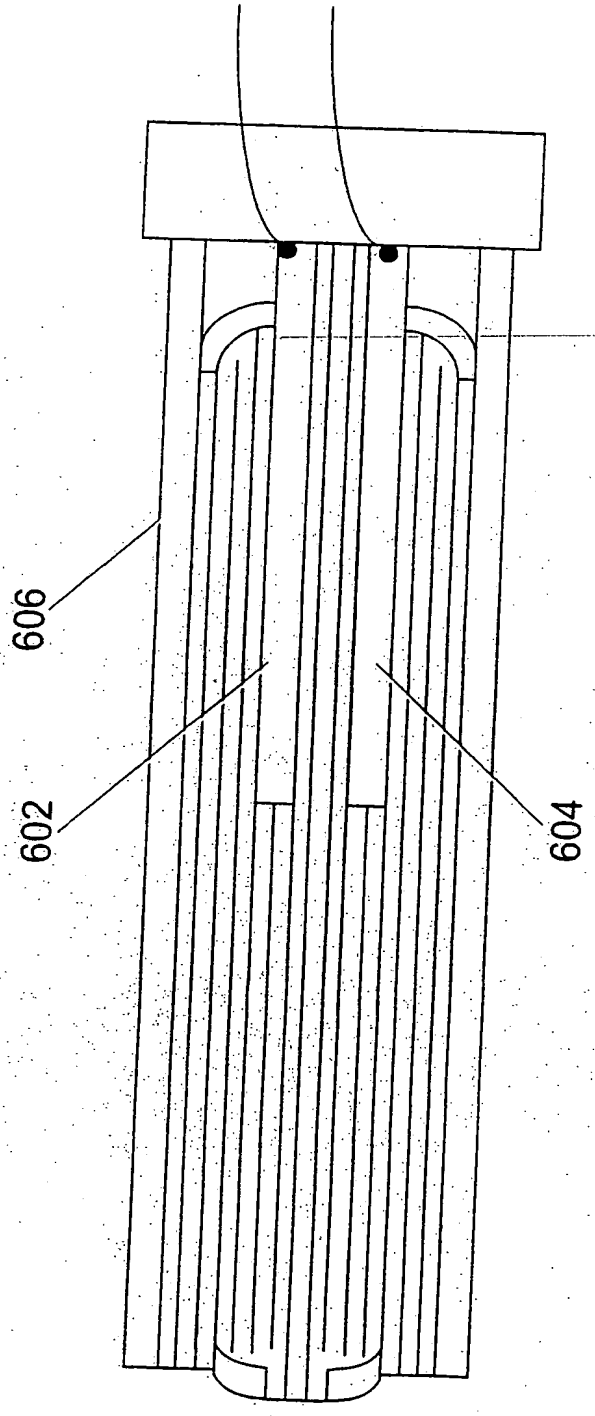

Fig. 5E

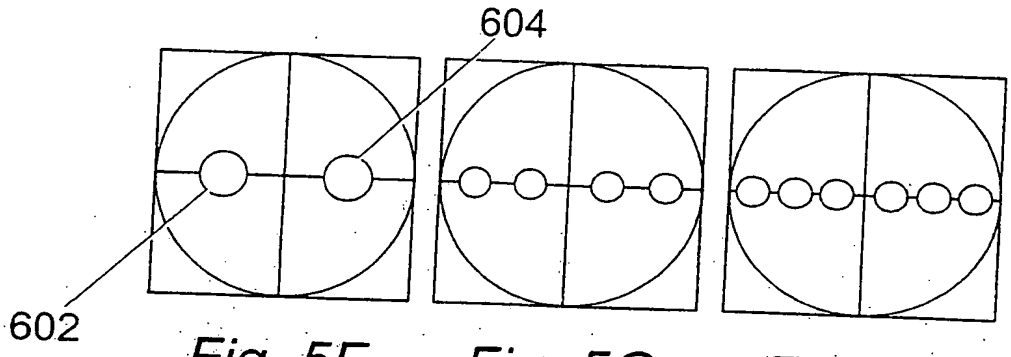

Fig. 5F Fig. 5G Fig. 5H

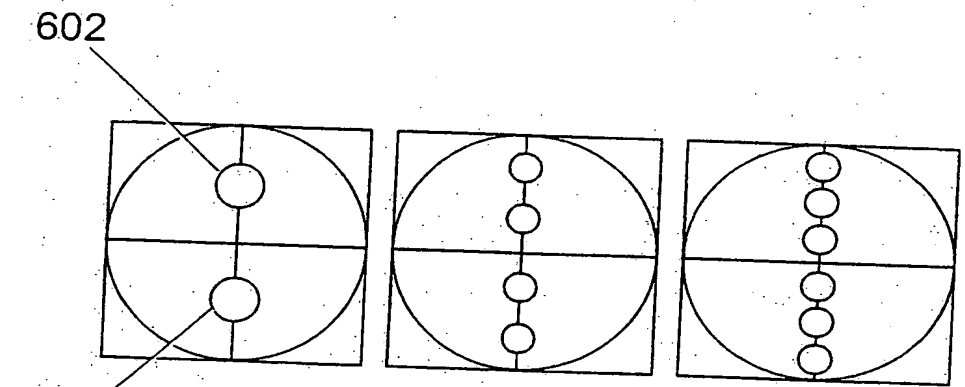

Fig. 5I Fig. 5J Fig. 5K

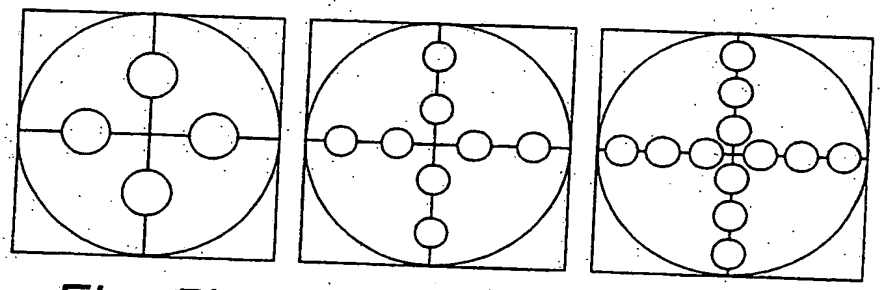

Fig. 5L Fig. 5M Fig. 5N

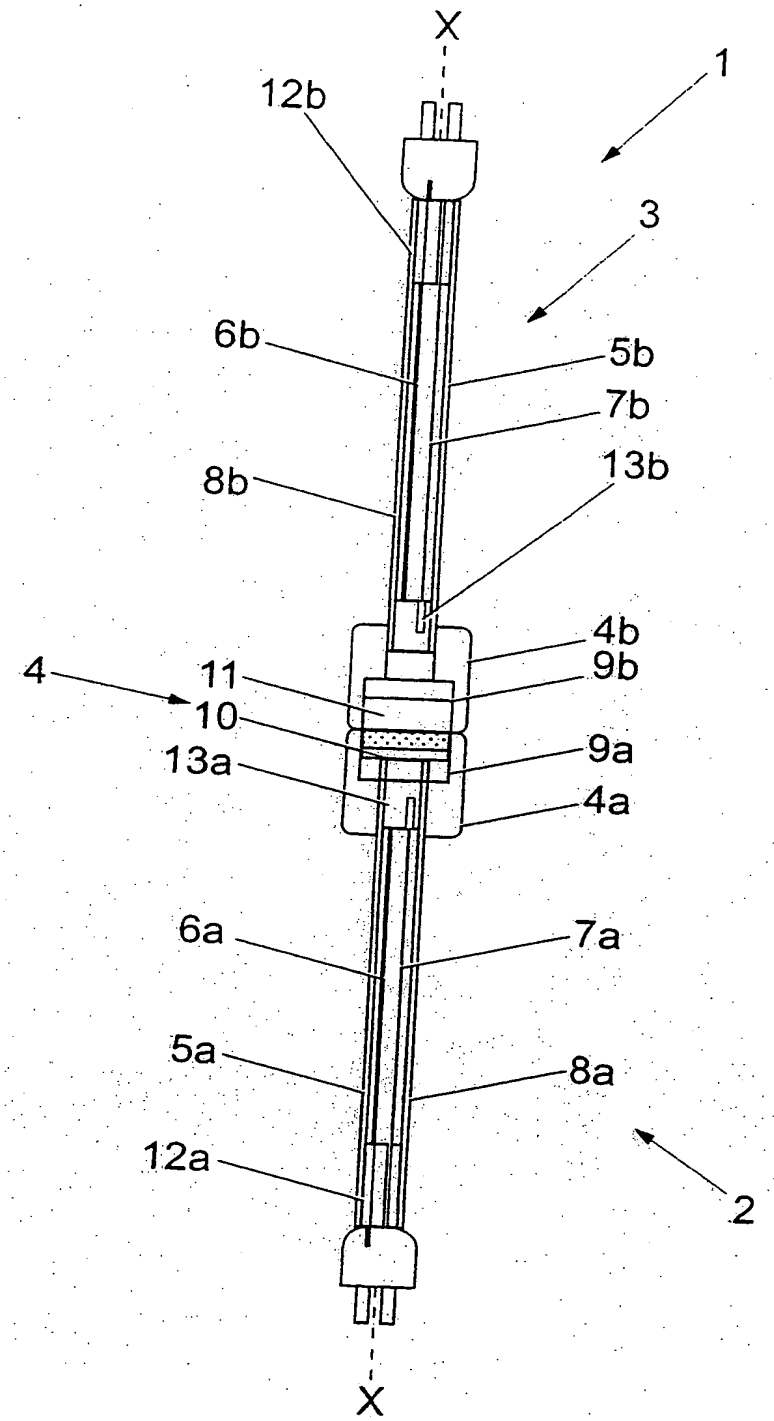

Fig. 6A

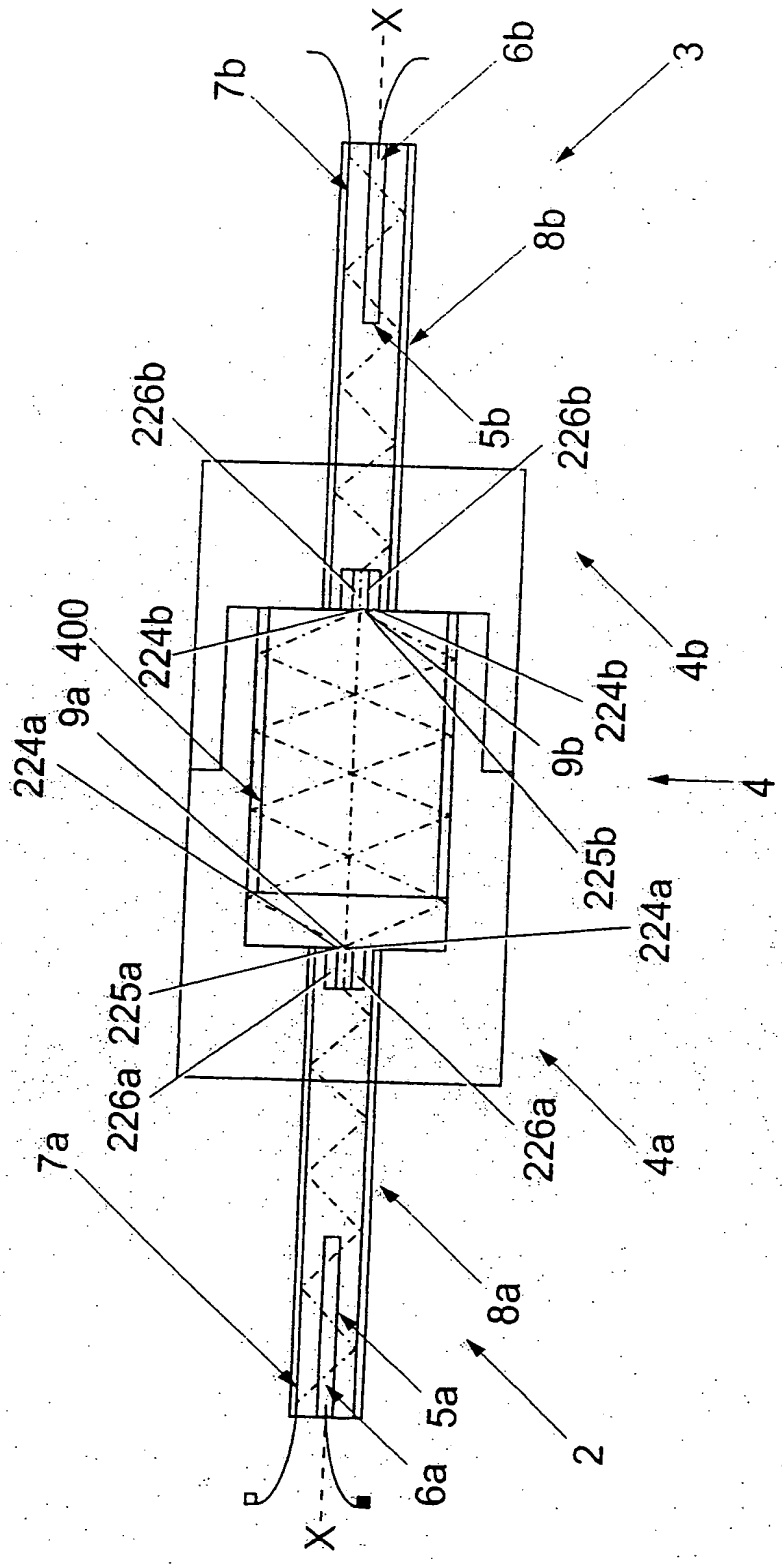
X
7b
6b
3
8b
5b
226b
226b
224b
400
9a
224a
4b
224b
9b
4
225b
224a
225a
226a
226a
4a
7a
8a
5a
6a
2
X

Fig. 6B

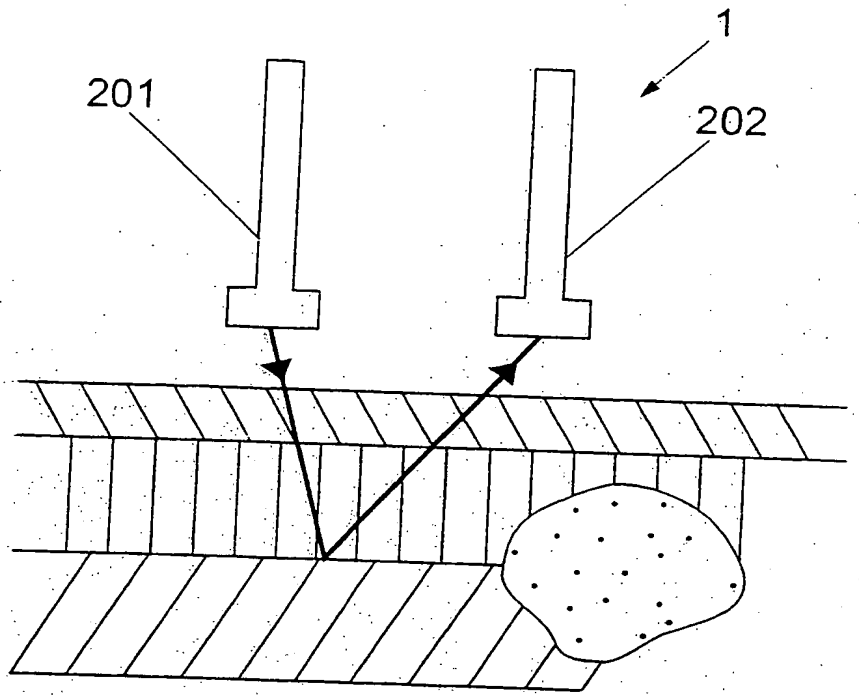

Fig. 7A

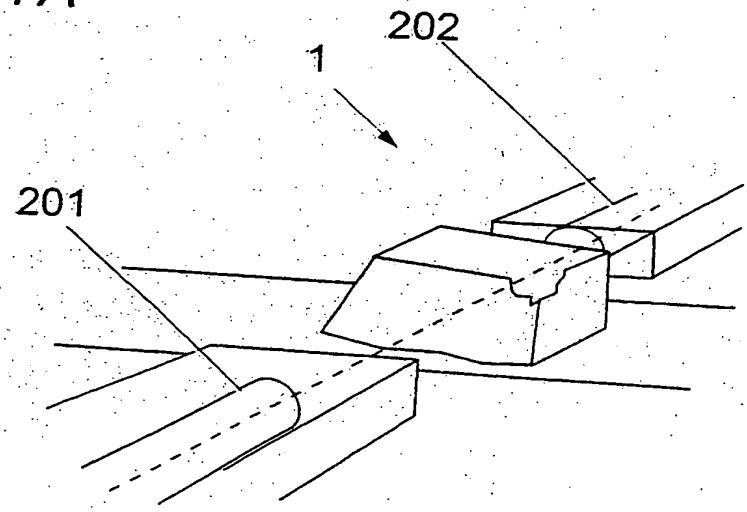

Fig. 7B

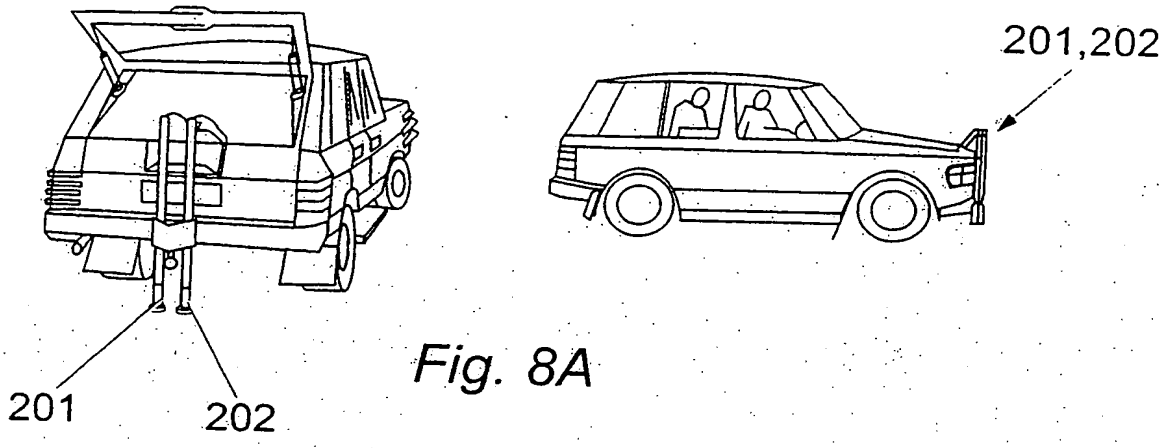

Fig. 8A

Fig. 8B

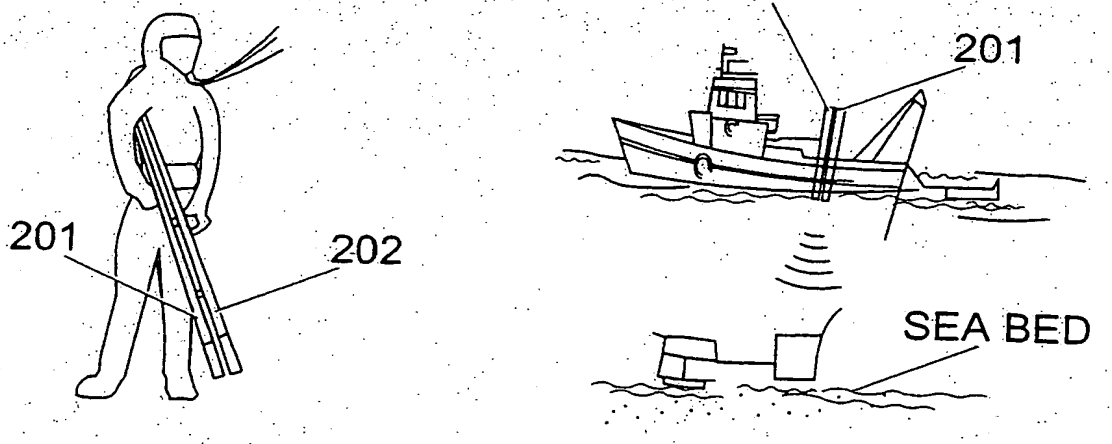

Fig. 8C

Fig. 8D

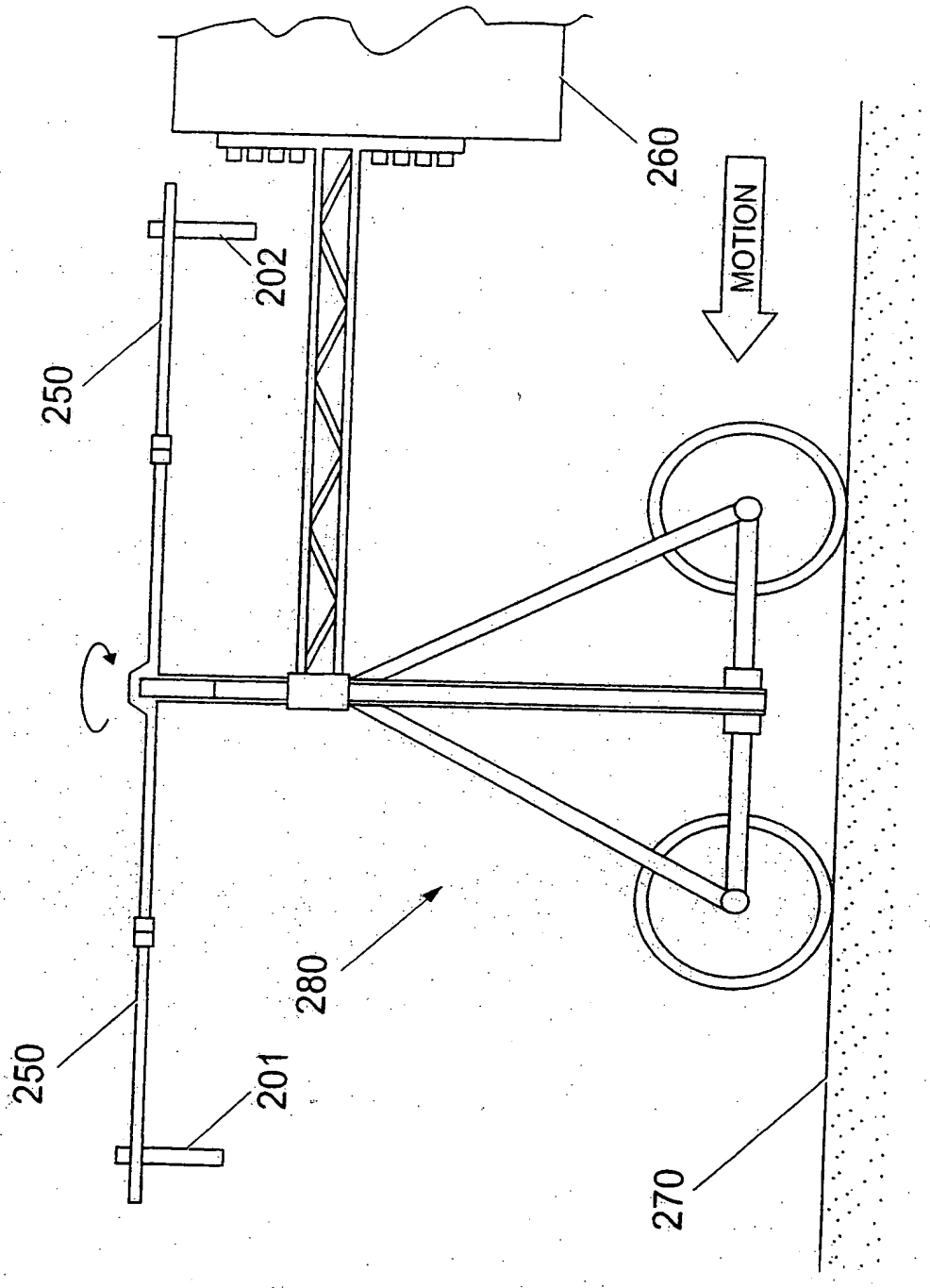

Fig. 9

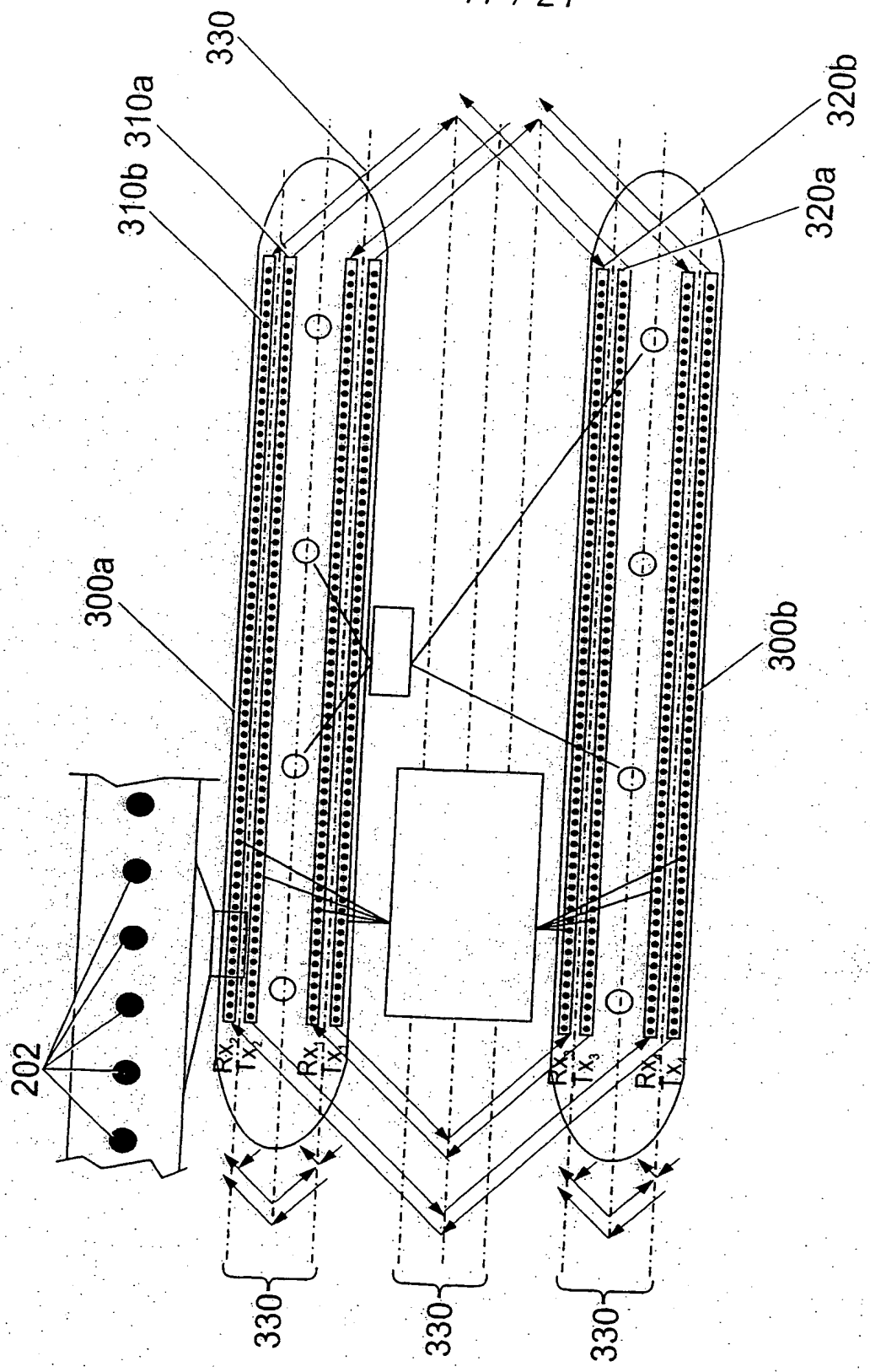
330
310a
310b
320b
320a
300a
300b
202
Rx_2
Tx_2
Rx_1
Tx_1
Rx_3
Tx_3
Rx_4
Tx_4
330
330
330

Fig. 10

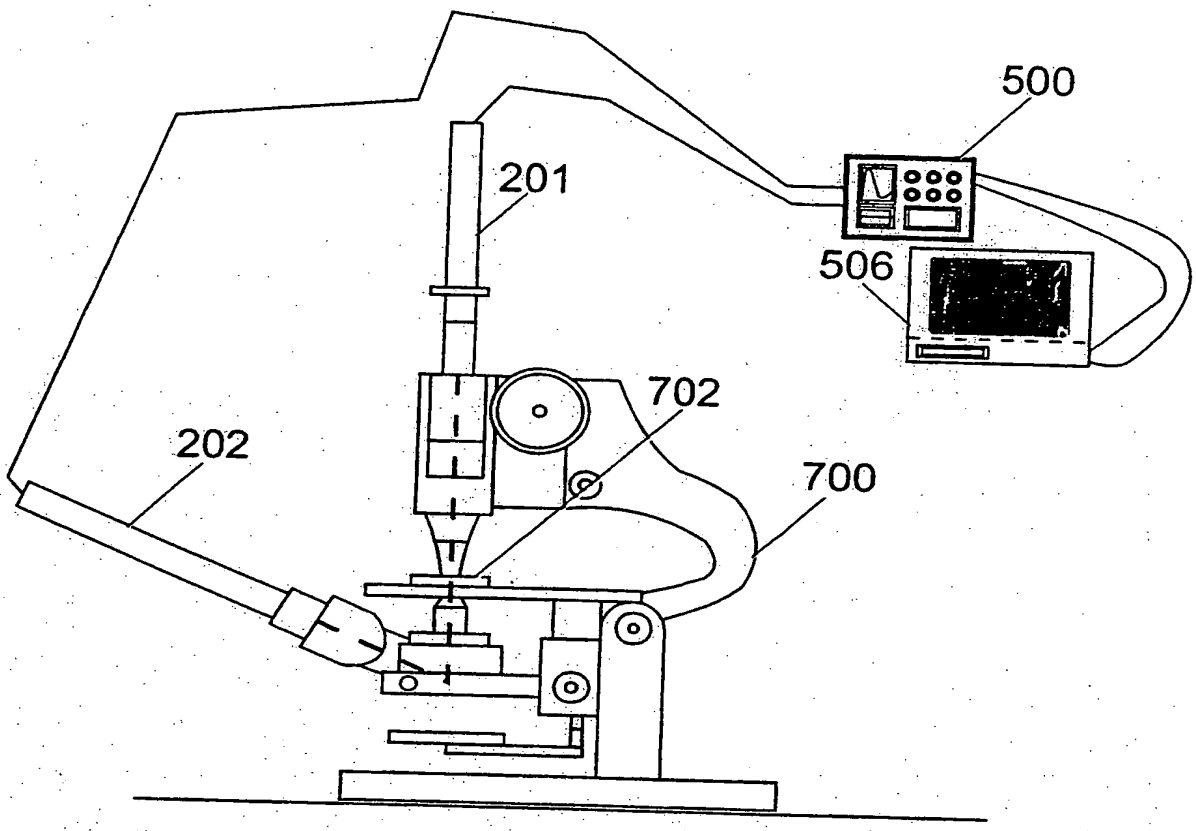

Fig. 11A

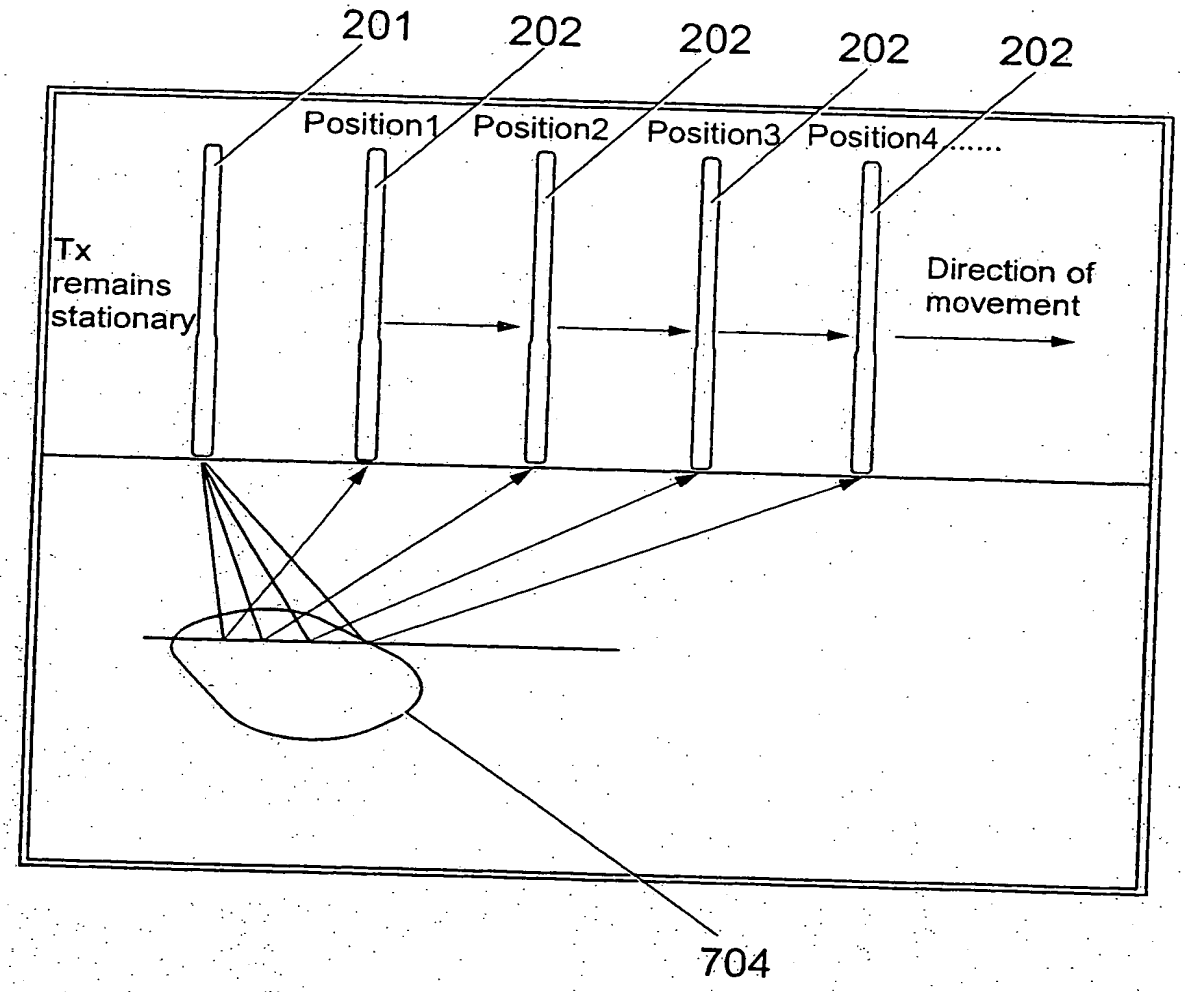
201
202
202
202
202
Position1
Position2
Position3
Position4.....
Tx
remains
stationary
Direction of
movement
704

Fig. 11B

MODE	Resolution Time (ps)	Resolution Space (m) (in salt water)	PRF (kHz)	Pw (ns)	TR (ns)	Fmax (MHz)	Fmin (MHz)	Ptr	ScanRate (traces/s)	1/SR (Sdelay)	Ts (ns)
A1	50	0.00167	100	0.1	2	10000	1000	40	2500	0.0004	0.05
A2	50	0.00167	100	0.1	5	10000	1000	100	1000	0.001	0.05
A3	100	0.00167	100	0.1	10	5000	500	100	1000	0.001	0.1
A4	250	0.00167	100	0.1	15	2000	200	60	1667	0.0006	0.25
A5	500	0.00167	100	0.1	25	1000	100	50	2000	0.0005	0.5
B1	250	0.01667	100	1	2000	2000	125	8000	12.5	0.08	0.25
B2	500	0.01667	100	1	4000	1000	62.5	8000	12.5	0.08	0.5
B3	625	0.01667	100	1	6000	800	50	9600	10.4	0.096	0.625
B4	1250	0.01667	50	1	8000	400	25	6400	7.8125	0.128	1.25
B5	2500	0.01667	25	1	10000	200	12.5	4000	6.25	0.16	2.5
C1	2500	0.16667	50	10	20000	200	12.5	8000	0.625	1.6	2.5
C2	5000	0.16667	25	10	40000	100	6.25	8000	0.3125	3.2	5
C3	10000	0.16667	12.5	10	80000	50	2.25	8000	0.15625	6.4	10
C4	40000	0.16667	6.25	10	160000	12.5	1	4000	0.15625	6.4	10
C5	62500	0.16667	3.125	10	250000	12.5	1	4000	0.078125	12.8	40

Sampling Rate=Fs=2*Fmax
Range for all generic types=1/4Fmax-4 Fmax
Ptr=Time Range(TR)/Sampling Time (ts)
Sampling Time=Ts=1/2Fmax, time occupied
by 1 pixel in the y-direction going down the trace

Fig. 12

Ptr = number of pixels per trace
PRF = Pulse Repetition Frequency
Pw = Pulse Width
TR = Time Range
Fmax = Maximum Frequency
Fmin = Minimum Frequency
Resolution Time = time between pixels going down the trace
SR = Sampling Rate

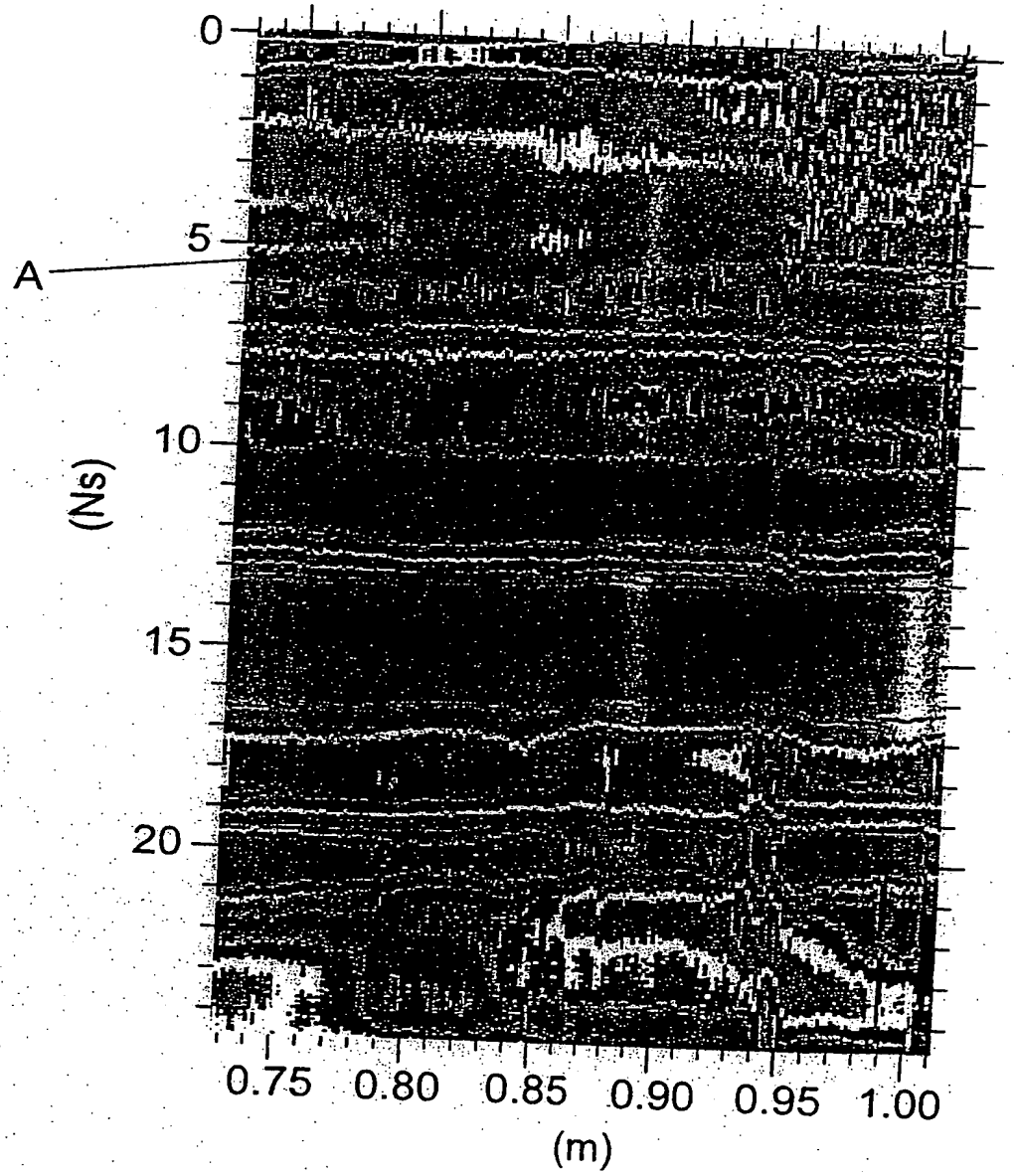

Fig. 13